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IMPACT OF PRECISION GUIDED MUNITIONS ON PLANNING OPERATIONAL FIRES

BY

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A paper submitted to the faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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15.Abstract:

The emergence and future military dominance of precision guided munitions (PGMs) significantly influence time, space, and force operational fires planning factors, but have not significantly changed the theory and objectives of operational fires. PGMs reduce the time needed to deploy operational forces and the time required in achieving decisive results. Precision enhanced operational fires now eliminate previous geographical limitations on operational fires. The improved accuracy of PGMs translates to reduced airpower platforms to achieve desired results. The greatest danger in the advance of PGMs is the flawed assumption, leading to inadequate planning, that precision enhanced fires can deliver quick unilateral decisive victory. Operational fires theory and objectives are enhanced, but not revolutionized by PGMs. Operational commanders should apply existing theory and objectives with significantly enhanced time, space, and force operational planning factors to maximize planning operational fires.

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ABSTRACT

The emergence and future military dominance of precision guided munitions (PGMs) significantly influence time, space, and force operational fires planning factors, but have not significantly changed the theory and objectives of operational fires. PGMs reduce the time needed to deploy operational forces and the time required in achieving decisive results. Precision enhanced operational fires now eliminate previous geographical limitations on operational fires. The improved accuracy of PGMs translates to reduced airpower platforms to achieve desired results. The greatest danger in the advance of PGMs is the flawed assumption, leading to inadequate planning, that precision enhanced fires can deliver quick unilateral decisive victory. Operational fires theory and objectives are enhanced, but not revolutionized by PGMs. Operational commanders should apply existing theory and objectives with significantly enhanced time, space, and force operational planning factors to maximize planning operational fires.

INTRODUCTION

Have technological advances in precision guided munitions (PGMs) revolutionized planning lethal operational fires? Joint Vision 2010 and the implementation of the precision engagement concept promote continued advancements in military technology. Operational commanders must remain abreast of major changes in technology and potential changes in operational functions, specifically operational fires. These changes, frequently referred to as revolutions in military affairs (RMA), have the potential for changing operational theory and objectives. PGMs, enhanced by technology, now play a major role in planning operational fires. This topic is important for current and future operational commanders since PGM firepower provides a critical component of combat power. Moreover, combat power influences the outcome of major operations and campaigns. The emergence and future dominance of PGMs in military operations significantly influence time, space, and force operational fires planning factors, but have not changed the theory and objectives of planning operational fires.

Commanders, theorists, and planners often use different terms to describe operational fires. The overlap of strategic fires at one end of the spectrum and tactical fires on the other end, compounds the problem of finding a common definition. This places operational fires in the middle of that spectrum, making it important to agree on a common definition. Fire support, fires, operational fires, and airpower are all sometimes used to describe firepower planned and executed by an operational or joint task force commander in his assigned theater of operations. The influence of precision munitions in support of an operational commander in his theater, regardless of the name given, is the focus of this analysis and discussion.

BACKGROUND

Operational Fires

Using fires or firepower to achieve decisive results in a major operation or campaign is the primary theoretical underpinning of operational fires.[1] It is, however, simpler to define firepower in terms of what it does, rather than what it is. As Ralph Reece explains, it "provides destructive force to defeat the enemy's ability and will to fight."[2] Today's operational level commanders use airpower, artillery, naval fires, and special operating forces in planning and delivering lethal operational fires to achieve decisive results in the conduct of a major operation or campaign. Airplane and rocket technological advancements in World War II provided the means to implement operational fires theory, making it possible to achieve decisive results with firepower.

Theory is important because it provides the underlying argument for the use of operational fires. This underlying argument shapes the objectives by providing a supporting framework. Changes in theory have a major impact on planning objectives. Having a clear theory of operational fires is the first step in effectively planning operational fires.

Today's operational fires accomplish a large number of tasks associated with three primary objectives. First, operational fires overwhelm the enemy at critical points, facilitating operational maneuver; second, they interdict enemy forces that have not yet joined the tactical fight; and third, they destroy critical facilities or functions that will adversely affect the

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[1] Milan Vego, On Operational Art (Naval War College Press, 1998), 195. These fires are normally conducted beyond the boundaries of the area of operations in which a major operation or campaign is going to take place. Operational fires are planned by the operational commander and are normally conducted prior to, and can continue after, the start of a major operation or campaign. 357.

[2] Ralph G. Reece, Operational Fires (U.S. Air University, 1989), 5.

enemy's campaign plan.[3] These three objectives emerged during World War II and are applicable to planning operational fires even today.

Clear objectives are important in planning operational fires because they answer the "what" question related to operational fires. Objectives answer what fires should do to achieve decisive results.

The first major use of operational fires occurred in World War II. Operational fires theory grew from the already established value of fires firmly established by Napoleon a century earlier. The introduction of aircraft and guided missiles with increased speed and ranges supported the theory of using firepower to attack distant targets to achieve decisive operational results.[4] In World War II, operational fires effectively destroyed facilities and influenced follow-on forces.

The Allied decision to implement the "Transportation Plan" in the Normandy objective area prior to the D-Day invasion in June 1944, is one of the first uses of operational fires to isolate an objective area. The objective of the plan was to destroy enemy rail communications and isolate the Normandy landing area. Targeting and attacking marshalling areas, rail lines, and important bridges prevented the Germans from reinforcing their defensive positions on the Normandy coast.[5] The "Transportation Plan," executed by air delivered operational fires, was very successful in limiting German reinforcements, allowing the allies time to establish a lodgment following the D-Day invasion.

Offensive airpower continues to provide one of the primary means of executing operational fires today. Airpower is any use of airborne platforms to deliver munitions on a

[3] Reece, 10.
[4] Vego, 194.

target.[6] "The basic task of the weapons platform is to carry the projectile into range of the target."[7] This includes fixed wing aircraft, rotary wing aircraft, rockets, and missiles. Airpower is the method of choice for the United States to respond to a crisis with precision and offensive punch.[8] Air delivered munitions accounted for the majority of operational fires in World War II as well as five decades later in the Gulf War. Airpower is not restricted to air forces but includes a broad spectrum of means including air force, naval, army, and Marine platforms.

Current doctrine refers to fires by several different names and the distinction between tactical and operational fires is often blurred. Joint publication 3-09, *Doctrine for Joint Fire Support,* highlights the importance of joint fire support planning in achieving operational objectives. It also outlines the critical role of targeting and joint fire support sub-systems. Careful planning allows target acquisition, command and control, and attack on resources to achieve a synergistic effect in the theater of operation.[9] The planning and use of firepower by an operational commander, in a designated theater, fits the theory and definition of operational fires.

Before examining PGMs, it is important to understand the history and role of conventional munitions. Conventional munitions are those munitions delivered without the aid of enhancements to achieve direct or near direct engagement on the target. Conventional munitions are traditionally aimed and guided to targets by a variety of techniques, from

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[5] Walt W. Ralston, Pre-Invasion Bombing Strategy (Austin: University of Texas Press, 1981), 91-98.
[6] Francis M. Brown, JV 2010: How the Precision Engagement of Offensive Airpower Applies to Military Operations other Than War (MOOTW) (Montgomery: Air University Press, 1998), 3.
[7] George Friedman and Meredith Friedman, The Future of War: Power, Technology, and American World Dominance in the 21st Century (New York: Crown Publishers, 1996), 29.
[8] Brown, 12.

simple iron sights to computer assisted calculations to direct essentially free-falling munitions. These delivery techniques, while increasingly more accurate when aided by computer calculations, still have a large hit probability error when compared to PGMs. Because of limited accuracy, conventional munitions require a greater volume of ordinance and supporting delivery platforms to achieve desired results. Conventional weapons dominated operational fires from World War II until Desert Storm when precision guided munitions made a significant contribution to operational fires.

Precision Guided Munitions

"Precision-guided munitions refers not to a single weapon but to an entire class of weapons distinguished by their ability to strike targets with precision on a regular basis."[10] Smart weapons follow a non-ballistic trajectory using some type of terminal guidance system to ensure a very high hit probability. Brilliant weapons are those that have autonomous fire control systems that can detect, classify, and track a target without human intervention.[11] Brilliant weapons incorporate advanced decision-making algorithms to attack specific targets within their footprint.[12] We are developing and fielding numerous advanced weapons and munitions that provide standoff, accurate global positioning system (GPS) delivery, and brilliant submunitions.[13] PGMs provide a major enhancement to operational fires.

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[9] Joint Chiefs of Staff, Doctrine for Joint Fire Support (Joint Pub 3-09) (Washington, D.C.: May 1998), I-1 to II-7.
[10] Friedman, 269.
[11] Kenneth S. Brower and Steven L. Canby, "The Future of Smart Weapons Proceedings from a AAAS Annual Meeting Symposium, Weapons for Land Warfare," American Association for the Advancement of Science, 8 February 1992.
[12] Robert F. Arnone, Educating our Bullets; A Roadmap to Munitions Centrality (Carlisle: US Army War College Press, April 1998), 3-6.
[13] Transforming U.S. forces for the Future. http://www.fas.org/man/docs/qdr/sec7.htm1. 2.

A major contribution of PGMs is improved accuracy. Improved accuracy has an impact on aircraft risk and collateral damage considerations in planning operational fires. Improved accuracy means fewer sorties needed to complete a mission, which translates into fewer aircraft exposed to hostile fire. This is important since risk to pilots is an important consideration in planning operational fires. Accuracy also means a reduction in collateral damage in the target area. Overall, PGMs bring greater accuracy with the expectation of reduced pilot risk and less collateral damage.

"Man in the loop (MITL) precision is defined as the ability to guide a weapon to a specific target with an operator (of the weapon or weapons system) terminally guiding the weapon to its impact point."[14] MITL is one of the first and most widely used PGM concepts. It includes television, infrared, and laser guided munitions. This advancement provides greater accuracy over conventional weapons but still includes some risk to pilots because of the need to operate near the target area.

"Intelligent precision munitions can dispense with the human being in the loop or allow the human to control the weapon far away from the action. Humans select the target, do some initial management of the trajectory, but it is the projectile that assumes the burden of directing itself to the target, recognizing the target when it arrives, and guiding itself on the final assault. Humans do not have to be in a position to observe the attack and, therefore, would not require a weapons platform that would put them in danger."[15] This is a significant advancement in operational fires capability while reducing human and platform risk.

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[14] Brown, 19.
[15] Friedman, 270.

Autonomous standoff precision (ASP) weapons use computer and GPS terminal guidance. ASP weapons range from the Joint Air to Surface Standoff Missile to the Joint Direct Attack Munitions, which are currently operational in the B-2 Bomber fleet.[16]

Precision weapons allow friendly forces to very accurately strike numerous targets, significantly reducing the manpower and systems needed to achieve decisive results. The existence of precision guided weapons allows a single aircraft to accomplish missions that would have required hundreds of aircraft in the past.[17] Operation Deliberate Force, in 1995, demonstrated the effects of precision weapons when fighter pilots hit 97 percent of their targets with little collateral damage.[18]

The interaction between technology and precision has produced significant changes. We are now in an era of standoff weapons and increasing distances between weapon and target.[19] Technology supports precision as the cornerstone of today's operational fires. In the 21st Century, it will be possible to find, fix, track, and attack anything that moves on the surface of the earth.[20] Major advancements in surveillance coupled with equally impressive precision weapons have significantly enhanced operational fires.

PGMs IMPACT ON OPERATIONAL FIRES THEORY AND OBJECTIVES

There is no denying the major impact of PGMs on operational fires, but these changes have not created an RMA in the theory and objectives of planning operational fires. The

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[16] Brown, 21.
[17] Timothy M. Conroy, A Coming of Age: The implications of Precision Guided Munitions for Air Power (Monterey: Naval Postgraduate School Press, June 1993), 1.
[18] Precision Engagement, Airman, Jan 1999. 2.
[19] Curtis G. Phillips, Joint Vision 2010: Cultural Impacts of Precision Engagement. (Newport: Naval War College Press, February 1998), 1-6.
[20] Precision Engagement. http://www.fafb.af.mil/battlelab/Competencies/engage.htm. 1.

theory and objectives of operational fires remains valid, even enhanced by the advent of precision guided munitions. PGMs support existing theory and objectives by achieving decisive results in an objective area. Today's precision enhanced lethal operational fires possess the capability of achieving operational objectives by extending the battlefield in both space and time. By attacking enemy functions and formations throughout the depths of the theater, operational fires deny the enemy a place to hide and time to rest.[21] PGMs enhance the capabilities to achieve decisive results in major operations and campaigns by providing greater efficiency in implementing the theory of using fires to achieve decisive results.

PGMs have not changed either operational fires theory or objectives. Significant changes, or the requirement for changes, in theory and objectives are evidence of an RMA. These changes are not present or required. A comparison of the objectives of operational fires in World War II and Desert Storm reveal very similar results. In World War II, operational fires were planned to support operational maneuver, to interdict enemy forces, and to destroy forces and facilities. During Desert Storm, operational fires accomplished the same objectives by interdicting Iraqi reinforcements and destroying defensive forces.

The objectives of operational fires are also interchangeable with the "task" of fires. Army Field Manual 6-20-10 (Targeting) cites disrupt, delay, divert, damage, destroy, and limit as targeting objectives. These targeting objectives translate into the objectives of operational fires when applied at the operational level of war. They accomplish tasks that support the operational commander's aims. Operation Desert Storm highlights the

[21] Michael P. Sullivan, Revolution in Military Affairs: Its Impact on Operational Fires and the Future Battlefield (Carlisle: US Army War College Press, April 1996), 6.

effectiveness of operational fires in disrupting and destroying Iraqi forces. The objectives of operational fires remain valid today and into the near future.

The objectives of operational fires relate to the reason for acting with respect to the enemy. Operational fires accomplish a number of purposes at the operational level.[22] The Desert Storm success of airpower in delivering operational fires allowed ground forces to achieve victory very quickly and with minimal causalities. The objective of operational fires can be viewed in terms of decisively facilitating friendly aims by influencing enemy forces and facilities.

In summary, PGMs have enhanced, not revolutionized, operational fires theory and objectives. A RMA is defined as a significant change in theory and/or objectives. PGMs bring significant enhancements to operational fires, but not a revolution since the original theory and objectives remain valid today and into the near future. One approach in analyzing the significance of these enhancements is an examination of their impact on the time, space, and force considerations in planning lethal operational fires.

PGMs IMPACT ON OPERATIONAL FACTORS

Time

Time is one fixed and essential component of operational military action influenced by PGMs. Any military action requires a certain amount of time to plan, prepare, conduct, and sustain the activity. When compared with movement of forces and executing combat actions,

[22] Vego. The purposes of operational fires include: isolate/shape the "battlefield", facilitate friendly operational maneuver, prevent enemy operational maneuver, interdict enemy uncommitted forces, destroy/neutralize critical enemy functions and facilities, disrupt enemy logistical support, deceive the enemy as to the time and place of the major campaign/operation, diminish enemy morale, protect friendly areas of operations, protect friendly bases, prevent enemy forces from leading the theater. 203.

time can considerably increase operational freedom of maneuver and have a significant effect on the outcome of a major operation or campaign.[23] The time factor, enhanced by emerging technology, is a significant factor of warfare.[24]

Global strike platforms with the capability of delivering precision munitions anywhere in the world significantly influences deployment time factors. From World War II to Desert Storm, operational fires relied on lengthy deployment times to concentrate forces in the theater of operations. However, advances in air refueling and the extended range of today's bombers significantly reduce the time needed to establish a theater base of operations. Operation Allied Force serves as a good example of the significant reduction in time needed to deploy and build-up forces. Aircraft based in the continental United States were able to conduct missions around the world in Serbia, significantly reducing the time needed to deploy because they operated from home bases. PGM accuracy and the resultant reduced volume of required ordinance needed by air strike platforms to achieve effects, significantly reduces the overall time needed to deploy operational forces.

Naval missile platforms also reduce the time needed to establish a secure theater base of operations to support operational fires. Current and future forward-deployed naval platforms with PGMs are a major enhancement in reducing response times when planning operational fires.

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[23] Vego, 57.

[24] Ajay Singh, "Time: The New Dimension of Warfare," Joint Force Quarterly, Winter 1995-96, 57-61. "For centuries war was confined to two dimensions, breath and depth. The advent of airpower extended warfare into the third dimension." 57 "Time has always been a factor, now technology promises to allow time to play an independent and dominant role in shaping conflicts...a fourth dimension." 59

The greatest impact of precision on operational fires is the significant reduction in reaction time to achieve decisive results. With timely sensor information, precision weapons can achieve a very high probability of success against an array of operational targets. To take advantage of precision technology, the operational commander should continually evaluate their impact on the time component of planning operational fires. "The factor of time is the most critical and precious factor in the conduct of warfare. It is one of those rare commodities that once lost cannot be retrieved."[25] PGMs provide operational commanders a major improvement in response time when planning operational fires.

Space

The space factor is an essential component requiring careful consideration of many elements when planning operational fires.[26] Geography and weather conditions are two major factors in planning operational fires. The enemy's ability to use geography to negate operational fires and the reduction in space needed to position operational fires platforms are major PGM influenced planning factors.

Geography is no longer a major limiting factor in planning operational fires. Advancements in space based technology have greatly reduced geographic protection once afforded potential targets. Delivery platforms and precision munitions now have the capability to negotiate practically any terrain and even penetrate deep underground bunkers.

The reduced need for terrain to support delivery platforms is an indirect result of PGMs. Long range global platforms, naval delivery systems, and an overall reduced number of delivery platforms means reduced land space requirements support operational forces.

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[25] Vego, 65.

Historical weather conditions are another major considerations in planning operational fires and remain a valid limitation, even with PGMs. A limited number of platforms and munitions can successfully strike targets in all weather conditions, however, many current airplanes do not have an all-weather capability. NATO's inability to strike targets in adverse weather during Operation Allied Force over Serbia is a reminder of limitations on overcoming the challenges of adverse weather. PGM technology affords the operational commander an improved but limited operational fires response during adverse weather.

Forces

PGM technology is a major factor in improving existing forces and spawning new systems. Advances in technology have increased the range and accuracy of airplane, rocket, and missile systems. In addition, attack helicopters, special operating forces, and naval platforms, provide operational commanders a variety of delivery means. The improved accuracy and increased variety of today's systems reduce the overall forces needed to perform required missions.

In the past, theater air forces provided operational fires; however, the increasing range and accuracy of cannon, rocket, and missile systems, combined with maneuver and attack capabilities from attack helicopters and light forces, now provide operational commander with a variety of systems. Army ATACMS, with ranges more than 100 kilometers, is one example of an enhanced delivery platform now available to the operational commander. The ability of

[26] Vego, Space concerns the size and volume of potential area of land, water, and air affecting the operation. Space is a dynamic factor involving physical characteristics of the area, distances, and goestrategic positions. 21

each military service to engage targets at operational depths also demonstrates the inherent joint and potentially combined nature of operational fires.[27]

Sea-based firepower to support *Forward ...From the Sea* adds a new dimension to operational fires.[28] Sea-based fires eliminate the need for establishing a lodgment and land protection. A carrier battle group provides aircraft and missiles and great flexibility in delivering operational fires. Sea-based firepower also provides the capability to execute a large-scale precision ambush. This ambush provides a coordinated salvo-type surprise attack that produces effects of significantly greater magnitude than an equivalent volume of ammunition over an extended period.[29] This capability is significant because of the synergy achieved by operational surprise using firepower.

The following are a few of the systems available to the operational commander:

Tomahawk Land Attack Missile (TLAM) - is a 500-2,500 kilometer range surface or submarine launched cruise missile capable of accurately striking land targets. TLAMs aid the operational commander by providing a very accurate weapon launched from a sea platform. This weapon reduces the need to coordinate a base in the area of operations and reduces the need to provide the protection needed to support land based platforms in the theater of operations.

Joint Direct Attack Munitions (JDAM) - is a GPS guidance kit added to a 2,000-pound general purpose bomb that gives it precision accuracy. JDAM gives the operational planner

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[27] Chief of Staff of the Army, Decisive Force: The Army in Theater Operations, (FM 100-7) (Washington, D.C.: May 1995), 5-5.

[28] Eric H. Law, Decisive Impact Ashore: revolutions in Firepower and Campaigning From the Sea (Naval Post Graduate School, June 1998). 1-4 *Forward... From the Sea* is the Navy's operational concept defining how the Navy is expected to operate forward, projecting American power from the sea to influence events ashore in the littoral regions of the world."

[29] Law, 9-14.

the ability to transform conventional munitions into precision munitions. This ability significantly reduces the volume of ammunition needed to accomplish a specific task. This is particularly important in theaters where delivery systems and munitions are limited.

ATACMS/BAT - is an ATACMS delivered brilliant antiarmor submunition. It uses acoustic and infrared sensors to detect, target, and attack vehicle formations.[30] This system is a major breakthrough in affording the commander the ability to defeat enemy armor forces with almost no risk to the delivery platform.

Operational fires were not originally considered fire support and were furnished by assets other than those required by the tactical commander.[31] This is no longer the case. The competition for delivery systems will intensify as strategic, operational, and tactical levels of war compete for the same limited delivery platforms. As the range of assets used to support tactical maneuver increases, those same assets will play a more significant role in the delivery of operational fires.[32] This force reality will mean greater competition between strategic, operational, and tactical platforms.

The exponentially improved effects achieved by precision munitions make it cost effective to employ far fewer platforms to achieve the desired results. This further translates into reduced logistical requirements and greater flexibility in positioning battlespace. This coupled with the reduction in deployment time and improvement in the time to achieve results provides operational commanders a significantly enhanced operational fires capability.

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[30] Sullivan, 7-9.
[31] Sullivan, 5.

CAN OPERATIONAL FIRES DO IT ALL?

Several scholars have suggested that advances in technology and precision now allow operational fires to achieve decisive victory without the assistance of ground forces. There is an emerging danger of "overselling" precision enhanced fires. In preparing for World War II, the French overemphasized the elements of firepower and protection while the Germans emphasized a balanced approach of combined arms and applied firepower, maneuver, and protection as the situation demanded.[33] The French suffered a rapid, decisive defeat at the beginning of World War II. History has shown, it is not technology that brings success on the battlefield, but the application of the appropriate strategies coupled with operational concepts that will ensure victory.[34] "Successful wars breed the illusion that particular technologies will always be effective."[35] We must guard against falling victim to the misinterpretation that PGMs now afford leaders the capability to achieve independent, decisive victories in major operations or campaigns.

General (Retired) Otis highlights the emerging role of operational fires in his thesis on the ascendancy of fires.[36] His prediction that fires will dominate the 21st century has evoked supporters and critics. Supporters readily use Desert Storm airpower success as a historical

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[32] FM 100-7, 5-3.
[33] John F. Antal, The Ascendancy of Fires (Carlisle: US Army War College Press, 7 April 1998), 3-7.
[34] John Cappel and others, The Impact of Precision Engagement on the Organization of Joint Task Forces (Norfolk: Armed Forces Staff College Press), http://www.jwfc.js.mil/pages/fs2/art9.htm. 6.
[35] Friedman, 24.
[36] Glenn K. Otis, "Ascendancy of Fires," http://sill-www.army.mil/tngcmd/org/road_map/inter.htm, Field Artillery, June 1995, 2. He describes the use of surface assets, artillery, naval, fixed and rotary aircraft, and UAVs to deliver fires to destroy or neutralize the enemy. He highlights the devastating effects of precision guided munitions to paralyze the enemy.

example of the validity of ascendancy of fires theory. Critics argue and caution that fires alone provides a one-dimensional problem that future adversaries will easily circumvent.[37] Precision engagement [precision munitions] can shape the battlespace but it cannot accomplish all operational tasks.[38] The fundamental shortcoming of firepower is its inability to physically control ground. General Dennis Reimer, Chief of Staff of the US Army, cautions against he belief that precision strike weapons can win all future wars.[39]

Another expectation of PGMs is the ability to deliver munitions with no collateral damage. This unrealistic expectation can lead to political problems at the first failure to live up to this lofty goal. PGMs are very effective but not infallible, especially when they rely on timely sensor input. The errant Chinese embassy bombing during Operation Allied Force is a good example of the magnitude of potential mistakes when employing PGMs.

Another major drawback of PGMs is the unrealistic expectation that their use will result in a quick victory because of the ability to accurately strike intended targets. The quest for a quick victory can be observed in NATO's planning and expectations before Operation Allied Force in Serbia. NATO expected a quick victory in a few weeks based on the decisive effects of precision weapons. This expectation of a quick victory precluded the planning needed to sustain months of combat.

Operational commanders must be aware of the risk associated with predicting a quick victory based exclusively on the use of PGMs and their ability to accurately strike selected targets. Clausewitz cautions against attempting to make a reciprocal relationship between

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[37] Antal, 15-17.

[38] Dennis J. Reimer, "Dominant Maneuver and Precision Engagement," Joint Forces Quarterly (Winter 1996-97), 14.

time and energy. He reminds us of the influence of the laws of psychology and their impact on time rather than dynamics.[40]

CONCLUSION AND RECOMMENDATIONS

PGM technology has significantly enhanced operational fires, however the theory and objectives of planning operational fires are essentially unchanged. Significant improvements and even RMAs have produced advanced delivery platforms and brilliant munitions, but have not revolutionized the basic theory and objectives of planning operational fires. Enhanced operational fires allow commanders to apply proven theory and objectives to achieve success using operational fires in major operations and campaigns.

Operational commanders should continue to plan operational fires to achieve decisive results in major operations and campaigns. Planning operational fires to influence the enemy at critical points to facilitate operational maneuver, to interdict enemy forces that have not yet joined the tactical fight, and to destroy critical facilities or functions are valid current and future objectives.

PGM accuracy influence time, space, and force operational fires planning factors. The two major time factors include significantly reduced force deployment time coupled with condensed time to achieve effects on the target. PGM accuracy and delivery platforms allow operational planners to attack almost any ground target, greatly reducing previous geographical limitations. Additionally, PGM accuracy reduces the forces needed to achieve

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[39] Reimer, 13. History has shown that the human dimension of warfare of warfare cannot be countered by technology alone. Reimer maintains that technology cannot overcome the human factors, greed, fear, hate, revenge, or the other emotional factors that cause wars.

[40] Carl V. Clausewitz. On War. 597.

results. Reduced forces and accurate naval platforms combine to notably decrease theater space needed to position assets.

Operational commanders should maximize the benefit of reduced deployment times coupled with the reduced time needed to achieve results. This allows swift action with decisive results in a much shorter period. Reduced deployment times and near perfect accuracy promotes massing fires and operational surprise, previously impractical because of extended force build-up times and the limited accuracy of most munitions.

Operational commanders now have the advantage of reduced force requirements with less pilot risk to hostile fire. Fewer forces with and reduced pilot risk affords greater positioning flexibility and reduced logistics requirements.

PGMs have virtually eliminated geographical protection once afforded the enemy. Planners should now plan attacks against any terrestrial target under varied weather conditions. This enhances the capabilities and spectrum of operational fires.

The presence of PGMs enhances the theory of using operational fires to achieve decisive results. Precision enhanced fires remain a viable means of facilitating operational maneuver, interdicting enemy forces, and destroying critical facilities or functions. Delaying, disrupting, diverting, damaging, destroying, and limiting enemy forces are objectives operational commanders should plan to maximize operational fires. Established theory and objectives with PGM enhancements, significantly influence time, space, and force operational fires planning factors, and should be exploited by operational commanders planning lethal operational fires.

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